Subsurface Barrier Containment System

Technology Need:

DOE landfills contain more than 3 million cubic meters of buried waste that have special cleanup needs. The Cold War legacy and disposal practices used decades ago left these landfills and other trenches, pits, and disposal sites filled with materials that are becoming detrimental to human safety and health. Solid waste forms included barrels, boxes, and other large objects such as storage tanks, vehicles, pipes, and beams. Disposal of hazardous liquids also occurred. Disposal areas such as that illustrated in the historic photo below exist at many of the DOE sites such as Oak Ridge, Savannah River, Hanford, and Idaho. The DOE could benefit greatly from an effective method to hydraulically isolate buried waste without disturbing the waste material.

Figure 1: Historic photo of DOE waste disposal trench

Technology Description:

The Subsurface Containment System (SCS) is a unique technology capable of encapsulating a waste site with barriers along all sides and the bottom without removing the waste. The barrier system can be constructed in a variety of subsurface media such as soil and bedrock, and in variable conditions that are both unsaturated and saturated. Specialized construction practices are used to install the barriers without disruption of waste.

The installation system, illustrated in Figure 2, uses a combination of conventional and specialized construction equipment and methods. Backhoes and excavators are used to excavate side and end trenches. Shoring boxes are used to support these trenches while a mobile crane installs prefabricated trench barriers. These trenches provide access for a specially designed, remote-controlled Slot Barrier Placement Machine that is positioned to install the bottom barrier. This equipment is capable of excavating up to a 100-ft-wide, horizontal slot beneath a waste area. As excavation of the slot proceeds, a prefabricated slot barrier approximately 1-ft-thick, is placed to form the bottom barrier. The SCS installs underground barriers made of materials selected to function in specific waste site conditions.

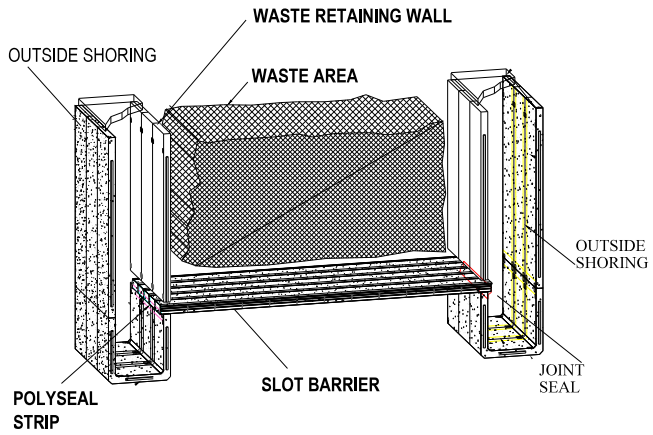

Figure 2. Installation Systems

For example, bottom barrier materials typically

combine concrete and a special liner to form a continuous layer of nearly impermeable material to isolate underground waste. During operation, verification of the continuity of the containment barrier is accomplished using a variety of inspection techniques. Monitoring of the barrier performance is conducted upon completion of installation.

Benefits:

▸*Reduced Risk* - Risk of worker contamination is lowered by requiring fewer personnel. The system also minimizes the potential for airborne release and soil and groundwater contamination thereby reducing environmental risks.

▸*Reduced Cost* - The current costs to remove, process, and store buried wastes typically range from $500-$1000/cubic yard or more. Full production of the SCS system at a waste site with nominal 30-ft width by 30-ft depth and 1000-ft length will result in significant cost savings and provide an enabling technology for bottom barrier installation at existing waste sites.

▸*Reduced Remediation Time* - The system is highly mobile and rapidly deployable. It provides construction speeds to 10 lineal feet per single shift operation with construction times that cannot be achieved by other methods.

▸*Breadth of Application* - It can be used at sites throughout the DOE complex. It can accommodate varying waste area configurations of up to 100-ft wide and 40-ft deep, and variable media ranging from soils to mixed rock with 40,000-psi compressive strength.

Status and Accomplishments:

The project is in the first phase of a two-phase effort. The Phase I objective was to complete a pilot test using the SCS to install a test barrier at an uncontaminated site. The optional Phase II includes a full-scale demonstration at a DOE site.

RAHCO completed the original Phase I scope of work in November 2001 and is currently working on additional Phase I tasks that are scheduled to be complete in February 2003. Phase I included design of the specialized installation equipment, barrier structure, and appropriate barrier materials, followed by manufacturing this equipment. A test bottom barrier was constructed at RAHCO's Spokane, WA facility. The test was designed to evaluate the functional performance of the SCS to excavate beneath a waste area, and to insert a bottom barrier. Results of the testing were compiled and summarized in a Phase I Topical Report.

Based on the Phase 1 Review, additional tasks were added to Phase I prior to proceeding with Phase II. Additional Phase I tasks included minor barrier design revisions; bench tests for barrier joint design; installation of a complete prototype in-ground barrier at RAHCO's Spokane facilities, and finally hydraulic testing of the barrier system.

Contacts:

Greg Barber
RAHCO International, Inc.
Phone: (509) 467-0770
E-mail: gbarber@rahco.com

Karen L. Cohen
National Energy Technology Laboratory
Phone: (412) 386-6667
E-mail: karen.cohen@netl.doe.gov

Online Resources:

Office of Science and Technology, Technology Management System (TMS), Tech ID # 2964
http://ost.em.doe.gov/tms

The National Energy Technology Laboratory Internet address is http://www.netl.doe.gov

The RAHCO International, Inc. Internet address is http://www.rahco.com